CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

As the world populations grow from time to time, the amounts and types of wastes being generated by the community have increased tremendously. Most of the wastes that have been produced nowadays will remain in the environment for hundreds or thousands of years. The invention of non-decaying waste materials, combined with the growing of consumer population, has caused in a waste disposal crisis. There were many types of industrial waste material and one of them is sewage sludge.

Sewage sludge or also known as bio solids is a by-product of municipal wastewater treatment. In Malaysia, the sewage sludge was mainly produced from domestic and light industrial area. It has been reported by Indah Water Konsortium Sdn. Bhd. (IWK) (1997) that Malaysia produce about 3 million m^3 of sewage sludge per year and it has been estimated to rise to 7 million m^3 in the year of 2020 (Noorain, 2013). Currently, IWK runs and manages over 4300 public sewerage system all over Malaysia and desludge and treats sludge from over 0.8 million septic tanks regularly and monitors effluent samples from sewage treatment plants to ensure they meet the standards made by Department of Environment.

Rapid urbanization, a consequence of economic development, nationally and globally, and also the increased of population in Malaysia has led to production of large quantities if sewage sludge in Malaysia and has posed serious environmental problems for their disposal. It has been reported that the total cost of managing the sewage sludge

alone is estimated at US$ 0.33 billion per year. However, the treated-sewage sludge is commonly being disposed either at landfills or being burned in incinerators.

1.2 PROBLEM STATEMENT

Concrete is a combination consists of cement, aggregate and water. The most commonly used fine aggregate is sand derived from the river banks. The consumption of natural sand taken from the river was too high due to its excessive use in concrete. The demands for this natural sand were increasing from time to time, especially on developing countries, for instance, Malaysia. Thus, the construction industries are in stress to identify alternative methods and materials to reduce the demand for natural sand.

On the contrary, the advantages of utilization of by-products or materials gained from the sewerage treatment plant, sewage sludge for instance, may reduce the negative environmental load impact and also the waste management cost, reduction of production cost as well as improving the quality of concrete produced.

In this context, the sewage sludge that have been dried and sieve should be similar to sand (fine aggregate) and satisfy the requirement of sand in concrete, which is to solidify and the necessary strength for a certain structure. Sand can fill up the pores or voids inside the concrete which is also a contributing factor for the strength of the concrete. As the sewage sludge would be finer than sand, it will act much better than sand to fill up the voids in concrete.

1.3 OBJECTIVE

The objectives of the study are:

a) To determine the suitability of sewage sludge as partial sand replacement in concrete.
b) To study the mechanical properties of sewage sludge concrete.
c) To compare the effect of air and water curing of sewage sludge concrete.

1.4 SCOPE OF STUDY

This study is focused on the behaviour of the concrete mixture when it containing various percentage of sewage sludge as partial sand replacement. The percentage varies from 0%, 20% and 40% by volume. Two mixes were prepared during this study, which are control mix and modified mix. The different between these two mixes is the percentage of sewage sludge included where the control mix consist 0% of sewage sludge while the modified mix consist varies of sewage sludge percentage.

The size of the concrete cube is fixed to 100x100x100 millimetres dimension and for the flexural test, mould with size of 100mm x 100mm x 500mm is used. For the curing process, the period of the concrete cube subjected to water is from 3, 7 and 28 days. The methods used for curing are air and water curing. The test for compressive and flexural strength of the concrete cube is conducted after the process of curing for each specimen.

1.5 IMPORTANCE OF STUDY

This study will provide all the information and knowledge regarding sewage sludge as the partial sand replacement in concrete. The strength, durability and the effect of the composition will be identified later on this study. The result from this study is expected to help reducing the excessive amount of sewage sludge wastage in Malaysia along with preserving the natural sand for the future usage. Furthermore, the information gained from this study will provide better understanding about this modified concrete mixture for further study and commercialization purpose.